

(No Model.)

E. KUHN.

PHOTOGRAPHIC SHUTTER.

No. 396,699.

Patented Jan. 22, 1889.

Fig. 1.

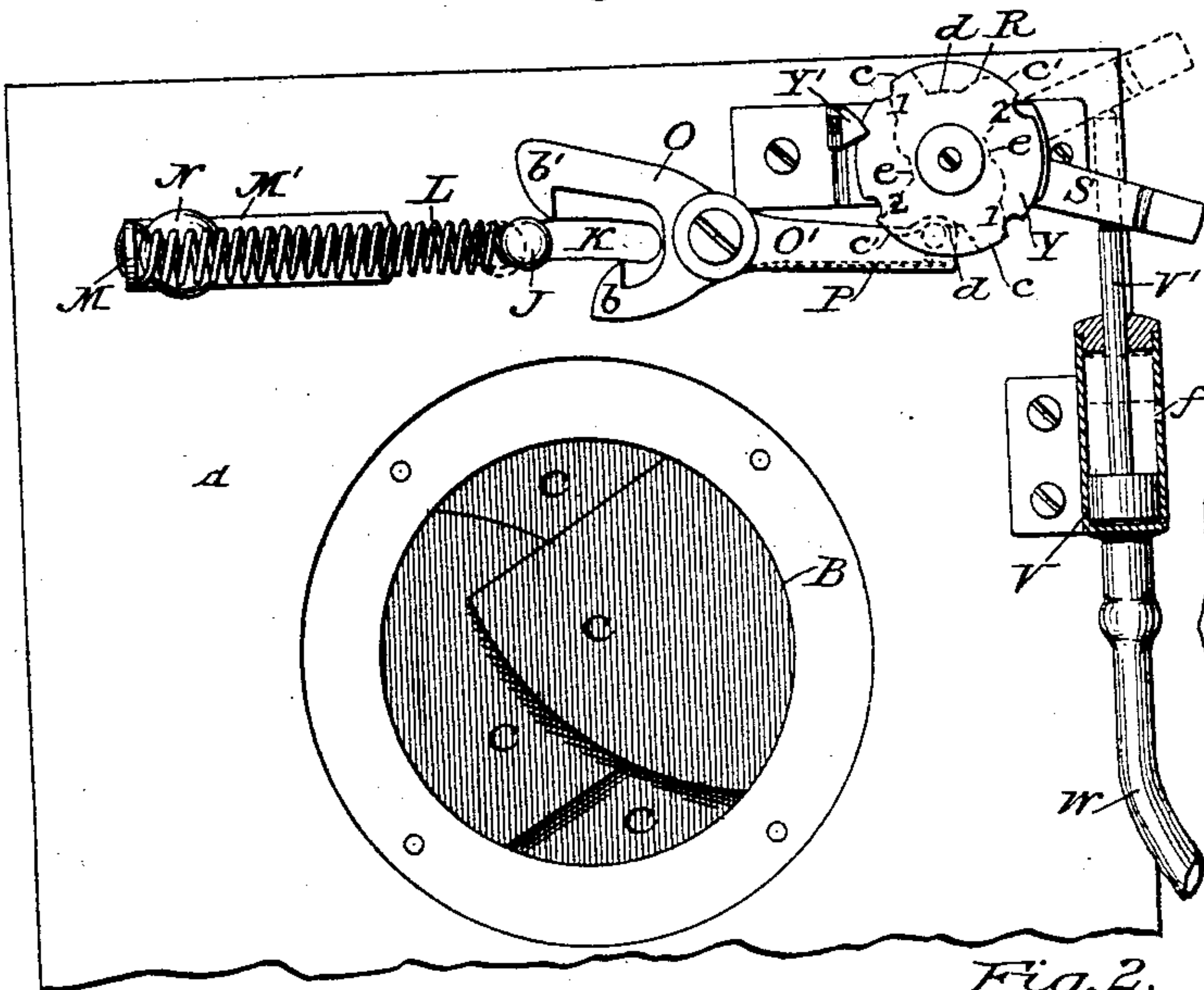


Fig. 4.

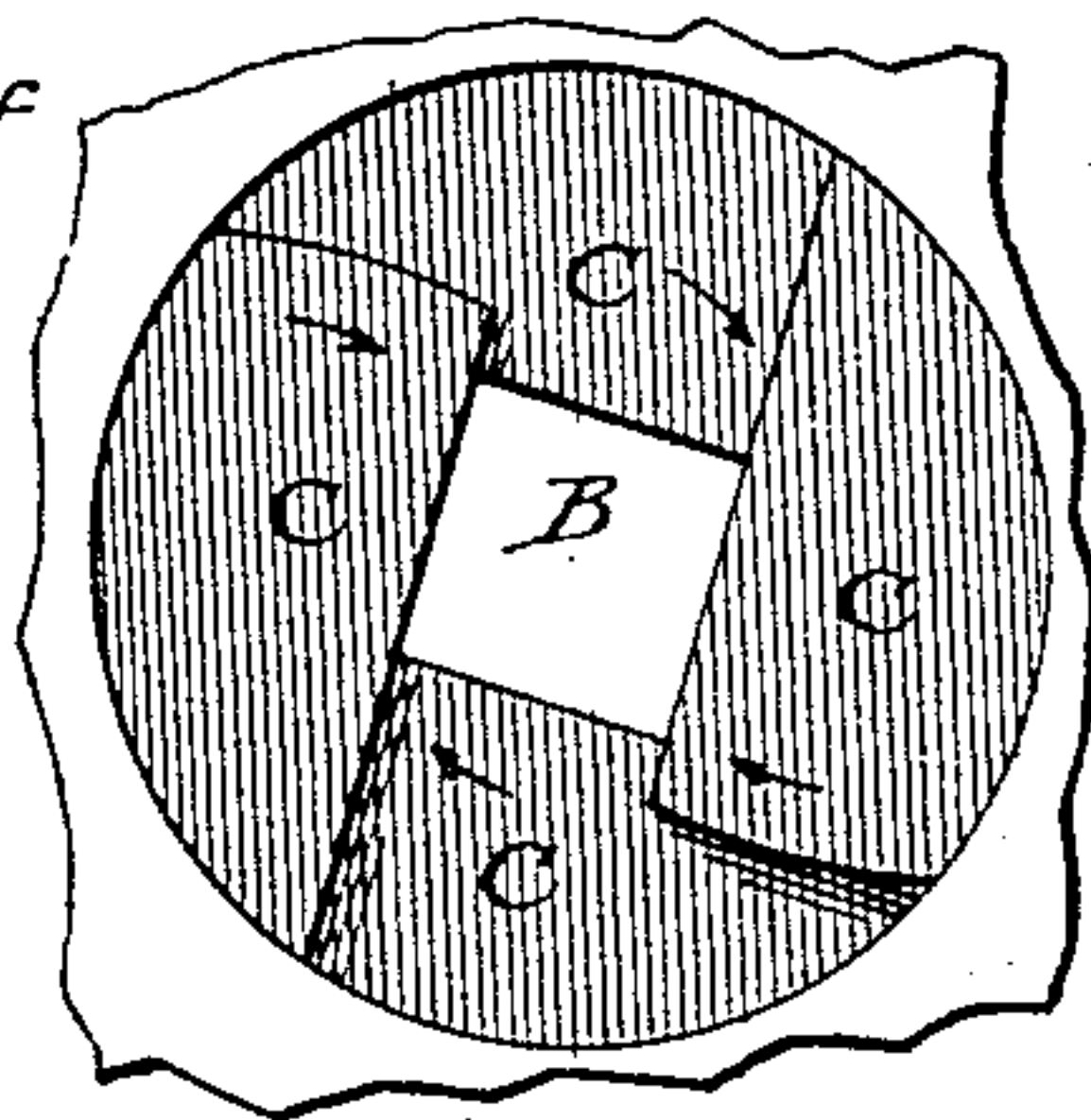


Fig. 2.

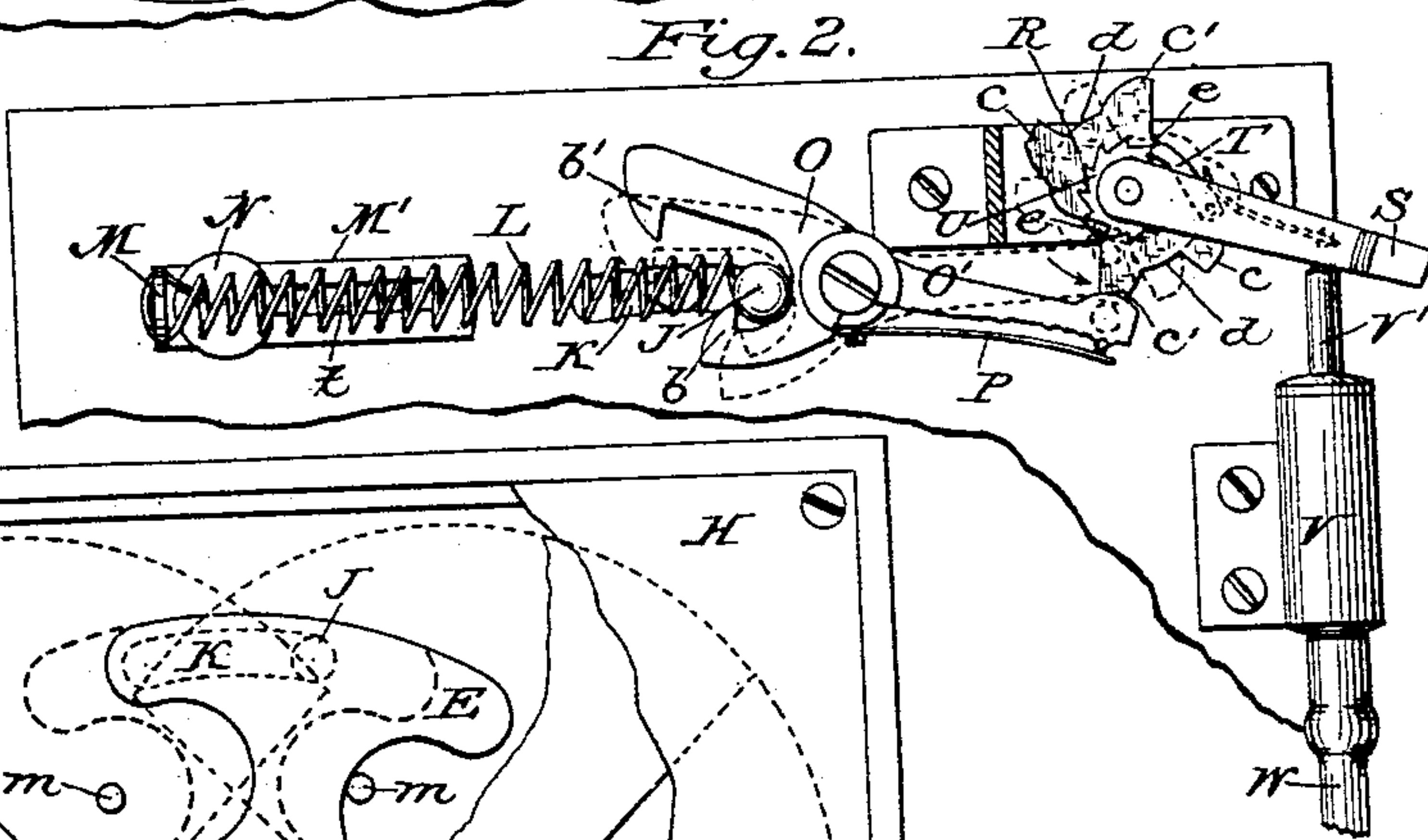
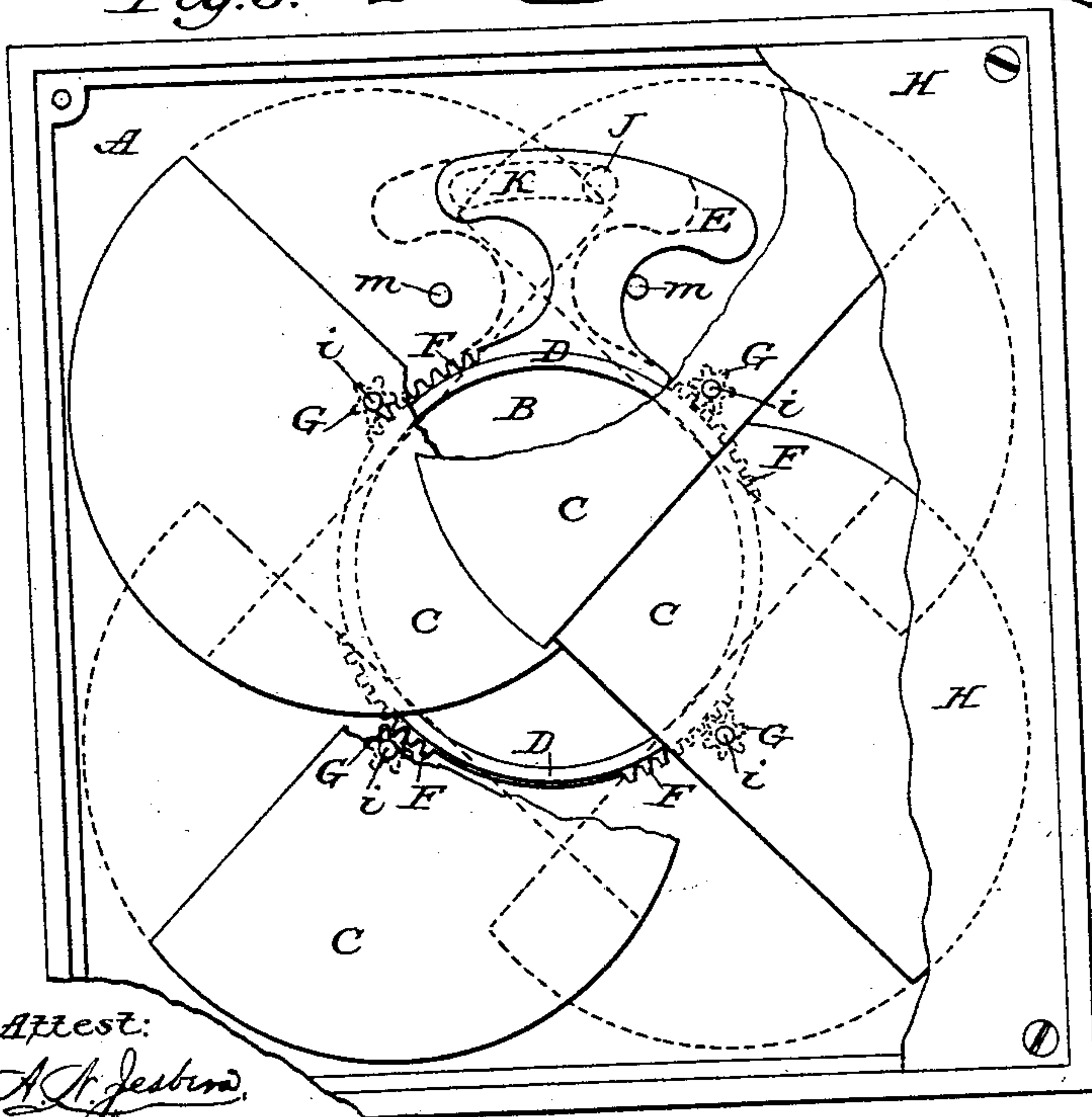


Fig. 3.



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UNITED STATES PATENT OFFICE.

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PHOTOGRAPHIC SHUTTER.

SPECIFICATION forming part of Letters Patent No. 396,699, dated January 22, 1889.

Application filed December 6, 1887. Serial No. 257,105. (No model.)

To all whom it may concern:

Be it known that I, EDMOND KUHN, of the city, county, and State of New York, have invented certain new and useful Improvements in Photographic Shutters; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification, in which—

Figure 1 is a front view of a camera with the lens removed, illustrating the application thereto of the operative devices for my improved "time" and "instantaneous" shutter, the piston-cylinder being shown in section. Fig. 2 is a similar front view of said devices, with the shutter-lever set for a time exposure and the cap-plate for the cam-wheel removed to expose said wheel fully to view. Fig. 3 is a rear view of the shutters, the covering-plate and a portion of the shutters being broken away. Fig. 4 is a detached front view of the lens-opening, illustrating the shutters partly opened to exhibit the method of their movement.

My invention relates to the automatic movement of the shutters in a photographic camera, either to produce a time exposure or to obtain an instantaneous view, and has for its object to facilitate the desired result by means of a more simple and effective device than any now in use.

For the purposes of my invention I combine with the lens-opening of the camera a series of four slides or shutters, each pivoted upon the margin of the opening by means of a pivot-pin at the middle of the longer side of the shutter, and in such manner as that the corresponding ends of the four shutters may swing simultaneously from four equidistant points inwardly over the opening to close it or outwardly to uncover it, whereby the opening is evenly and uniformly contracted on all sides toward the center in closing and is uniformly enlarged from the center outwardly in opening. The pivot of each shutter is provided with a small toothed wheel fixed thereon, and the lens-opening is encircled by a toothed ring adapted to engage simultaneously the several toothed wheels, so as to move them all in unison by its revolution, said ring being formed with an

arm projecting radially from its circumference as a means for revolving it and thereby actuating the shutters.

My invention consists in devices, as hereinafter fully described and claimed, for automatically actuating and for holding and releasing said arm to open and close the shutters.

In the accompanying drawings, A represents the front plate of a photographic camera, and B the lens-opening therein.

C C C C are shutters, consisting, preferably, of semicircular plates of thin sheet metal or other suitable material. Although preferably made semicircular in form, the shutters may be polygonal, it being only required that they shall each have a long straight edge of a length exceeding the diameter of the lens-opening and be of a width exceeding one-half of said diameter.

D, Fig. 3, is a metallic ring of a diameter slightly greater than that of the lens-opening B, and which is mounted to revolve freely about said opening upon the inner or under face of the plate A. An arm, E, projecting radially from said ring, serves as a lever or handle by which to produce its revolution, and a series of cogs or teeth, F F F F, are formed or cut in its periphery at four equidistant points. These teeth serve to engage four pinions, G G G G, each fitted upon a pin or spindle, *i*, journaled in the plate A at one end and in a covering-plate, H, at the other. Each of these spindles *i* serves as the pivot for one of the shutters C, the spindle being passed through an aperture in the middle of the larger straight side of the shutter and made fast thereto. The four pivots are placed at the extremities of two diametric lines, which intersect each other at right angles at the center of the opening B, and the pinion G of each shutter is so geared to the teeth F of the ring D as that the corresponding ends of all the shutters may be made to overlap evenly at the center of the opening B, so as to completely close the same. By thus arranging the several shutters, each in the same position relatively to the central opening, they will, when simultaneously turned, approach with their corresponding ends or corners the center of the opening from opposite points, and thereby gradually and evenly contract the

opening, as shown in Fig. 4, and finally, by their overlapping, will completely close it. By a reverse movement they will in like manner enlarge and uncover the opening from the center outwardly.

The lens-opening B will be opened or closed by a quarter-revolution of the shutters, and if their movement be continued in the same direction after they are fully opened they will close again by the overlapping of the ends opposite those which were just opened; hence by moving the shutters a half-revolution the lens-opening B will be not only uncovered, but covered again. If this movement be made continuous, an instantaneous exposure may be obtained, more or less quick, according to the rapidity of the movement; or by dividing the entire movement in the same direction into two steps, so as to make a quarter-revolution of the pinions at each, the opening may be uncovered at the first step for a time exposure and covered again at the second step, the interval between the two steps determining the duration of the exposure.

The movements of the toothed ring D, and consequently of the pinions G and of the four shutters C, actuated thereby, are readily produced by means of the lever E. This lever, projecting upwardly from the ring upon the inner side of the plate A, (see Fig. 3,) is fitted at its free end with a pin, J, to project therefrom through a slot, K, in the plate A, so as to facilitate moving the lever from the front or outer side of said plate. The end walls of the slot serve, in combination with the pin projecting through it, as stops to limit the movement of the lever E. Its movement may also be limited by stop-pins *m m*, inserted in the under side of the plate A, as shown in Fig. 3.

The slot K is so proportioned in length as to permit a movement of the lever sufficient to produce a half-revolution of the pinions and shutters, and is so located as that when the pin J is drawn against either end thereof the shutters C C will overlap and close the lens-opening, and when the pin is at the middle of the slot the shutters will be fully opened. The pin J is drawn automatically against one end of the slot by means of a spiral spring, L, extending from said pin to a post, M, mounted on a sliding plate, M', secured by a set-screw, N, passing through a longitudinal slot, *t*, (see Fig. 2,) in said plate. This slot permits of a movement of the plate M', with its post M, to and from the pin J when the set-screw N is loosened, whereby the tension of the spring may be readily adjusted at pleasure to produce a greater or less strain upon the lever E, and consequently a more or less rapid movement thereof under the influence of said spring.

An escapement-plate, O, is pivoted at the end of the slot K, opposite the spring L, said escapement being made by two hooks, *b b'*, formed in the plate, the one, *b*, to project upwardly in position to engage the lever-pin J

when it is drawn to the end of said slot, (in which position the shutters are closed,) and the other, *b'*, to project from the opposite direction in position to engage the pin J when it is midway the length of the slot, (in which position the shutters are open.) These hooks are so arranged as that when the pivoted escapement-plate in which they are formed is in a central position the pin J may pass freely by and between them to the end of the slot; but by tilting the plate slightly upward the lower hook, *b*, will be made to engage the pin, as shown in positive lines in Fig. 2; or, contrariwise, by tilting it slightly downward, the upper hook, *b'*, will arrest the pin, as shown in dotted lines in the same figure.

The escapement-plate is moved automatically by means of an arm, O', projecting therefrom, which is held by means of a spring, P, (see Fig. 2, and dotted lines, Fig. 1,) against the periphery of a cam-disk, R, pivoted to revolve above the end of said arm. This disk R is so shaped as to present four cam projections to the end of the arm, two of said cams being duplicates of the other two. These cams, formed at diametrically-opposite points on the periphery of the disk, are arranged in two pairs, each pair being a duplicate of the other, and are each made to project far enough so that when brought to bear upon the end of the escapement-arm the escapement shall be turned to bring the lower hook, *b*, into position to engage the lever-pin J, as shown in Fig. 2. Between the two cams *c c'* in each pair a recess, *d*, is formed, which will permit the arm to pass into a position in which the pin J will be free to move in its slot K, clear of both hooks *b* and *b'*, as shown in Fig. 1, and between each pair of cams a recess, *e*, is cut deep enough to allow the arm to move into a position in which the upper hook, *b'*, of the escapement will drop into position to engage the pin J.

The rotation of the cam-disk R is produced, as required, by means of a lever, S, pivoted upon the axis of the disk, and a spring-actuated pawl, T, pivoted to said lever to engage a ratchet-wheel, U, formed or attached to one side of the disk. The lever S is weighted, so as to drop automatically and draw back the pawl over the face of the ratchet. It may be moved up so as to cause an engagement of the pawl with the ratchet, and a movement thereby of the disk, by any suitable means, but preferably by means of a pneumatic piston, V, brought to bear against its outer end, and which is actuated in the customary manner by the compression of an elastic bulb connected with the piston-cylinder by a flexible tube, W. A lateral air-opening, *f*, in the piston allows the piston to drop promptly after each stroke thereof.

The positions of the several cams on the disk R are indicated by means of an index-plate, Y, fitted upon the outer end of the pivotal spindle, which carries the disk and its ratchet-wheel and a pointer, Y', at the edge

thereof, the cams in each pair being distinguished as 1 (for time) and 2 (for instantaneous.)

In the operation of this apparatus the lever-pin J is drawn over toward the escapement-plate O and caught by the lower hook, *b*, thereof. This engagement is then maintained by turning the cam-disk R until one of the cams *c* or *c'* is brought to bear upon the end of the escapement-arm O', which is held up against the same by the spring P. When the lever-pin J is thus held by the hook *b*, as shown in Fig. 2, the shutters are closed over the lens-opening B. If it be desired to make a time exposure of the plate, the cam *c'* on the disk is brought to bear on the escapement-arm O', as shown in Fig. 2. If now the piston-rod V' be forced up by means of a charge of air through the pipe W, it will move up the pawl-lever S, whereupon the pawl T, engaging the ratchet U, will cause the disk R to turn far enough to release the cam from the arm O', and the latter, flying up under the influence of its spring P into the recess *e* on the disk, will discharge the hook *b* from the pin J, so that the lever-arm E will be drawn automatically by the action of the spring L toward the spring; but as the escapement-arm in dropping off of the cam will fall in the deep recess *e* on the disk it will permit the escapement-hook *b'* to descend, so as to engage the pin J midway of its stroke and there arrest it. The movement of the lever E under the influence of the spring L one-half of its stroke will produce in manner as described a quarter-revolution of the shutters, thereby opening them. Another movement of the piston V, operating, as described, to turn the disk R, will now force out the escapement-arm O' sufficiently to release the hook *b'* from the pin, leaving the lever E free to complete its stroke, and thereby close the shutters again. If an instantaneous exposure be desired when the lower hook, *b*, of the escapement has been made to engage the lever-pin J, the end of the escapement-arm is made to bear upon one of the cams *c* on the cam-disk, so that when the disk is moved in manner as described, the arm dropping from the cam *c* shall rest in the recess *d*, and be thereby so supported as to prevent an engagement of the upper hook, *b'*, with the pin J, and the latter will be left free to make a full stroke the entire length of the slot K. This full stroke will produce a half-revolution of the shutters C C, so as to cause thereby first an opening and then a closing of the lens-opening in manner as described.

It is evident that the requisite movement of the cam-disk R or of a pawl-lever, S, to actuate it may be obtained in various ways; as by the finger of the operator or by a string attached to the lever S, or other known devices as equivalents for the pneumatic pis-

ton herein described, and I contemplate the use of any of these equivalent expedients and devices in connection with my invention.

I claim as my invention—

1. The combination, with the plate embracing the lens-opening in a photographic camera, a toothed ring revolving concentrically about the center of said opening as its axis, pinions geared to said ring, and shutters carried by said pinions to revolve therewith, of an arm projecting from said ring, a spring attached to said arm to draw it automatically in one direction, and stops adapted to limit the movement of the arm, all substantially in the manner and for the purpose herein set forth.

2. The combination, with the shutters pivoted to swing over the lens-opening in a photographic camera, pinions actuating said shutters, a toothed ring geared to said pinions, an arm extending from said ring, and stops limiting the movement thereof, of a pin projecting from said arm, an escapement plate pivoted in position to engage said pin and formed with two opposite hooks at different distances from its pivotal center wide enough apart to permit the pin on the arm to pass in a right line between them, a spring operating to draw the arm away from the escapement-plate, and mechanism, substantially as described, for moving said escapement-plate, all substantially in the manner and for the purpose herein set forth.

3. The combination, with the vibrating arm or lever E, the shutters C, controlling the lens-opening B, the intermediate mechanism, substantially as herein described, whereby the oscillation of the lever is made to open and close said shutters, a pin projecting from said lever, an escapement-plate pivoted in position to engage said pin and formed with two opposite hooks at different distances from its pivotal center wide enough apart to permit of the passage of the pin on the arm in a right line between them, a spring operating to draw the lever away from the escapement, and stops limiting the movement of the lever, of an arm projecting from said escapement-plate, a revolving disk having cams on its periphery to engage said arm and thereby determine the position of the escapement-hooks in relation to the lever-pin, and mechanism, substantially as described, for controlling and actuating said cam-disk, substantially in the manner and for the purpose herein set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDMOND KUHN.

Witnesses:

CARL PAUL STEIN,
A. N. JESBERA.